

# Sustainability of VSH-based *Varroa* resistance using colonies selected within commercial beekeeping operations

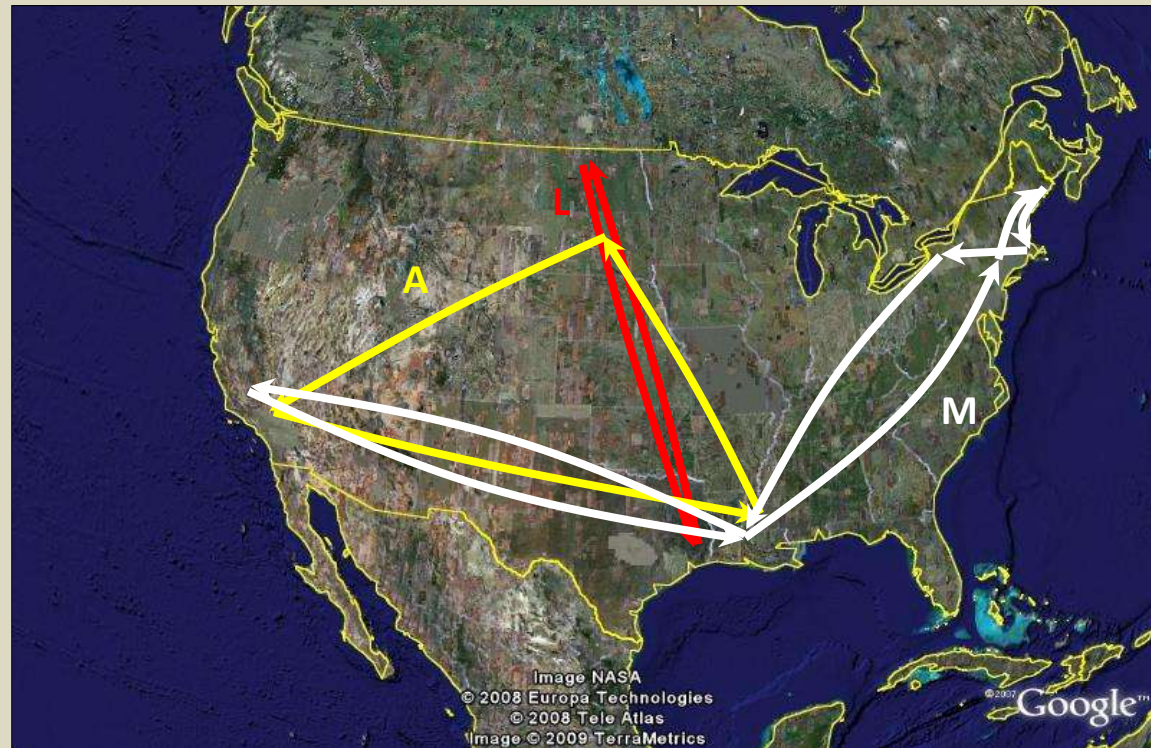
## BACKGROUND:

Since 2008 we have been selecting a subpopulation of VSH bees – called Pol-line Hygienic Italian -- that functioned relatively well during intense migratory beekeeping. The Pol-line population was developed by outcrossing VSH queens to commonly used (mostly Italian) bee stock in operations of collaborating beekeepers (one in 2008-10; three in 2011-12). We select the best performing colonies based on low levels of *Varroa* mites and large populations of adult bees. Each generation has included new outcrossed VSH and previous generation Pol-line sources. Our selection has continued through 2013. Here we present field data collected in the last two seasons of the program.

## METHODS:



VSH or Pol-line queens cells are added to splits in the commercial operations and queens allowed to open mate, thus producing colonies of F<sub>1</sub> worker bees.

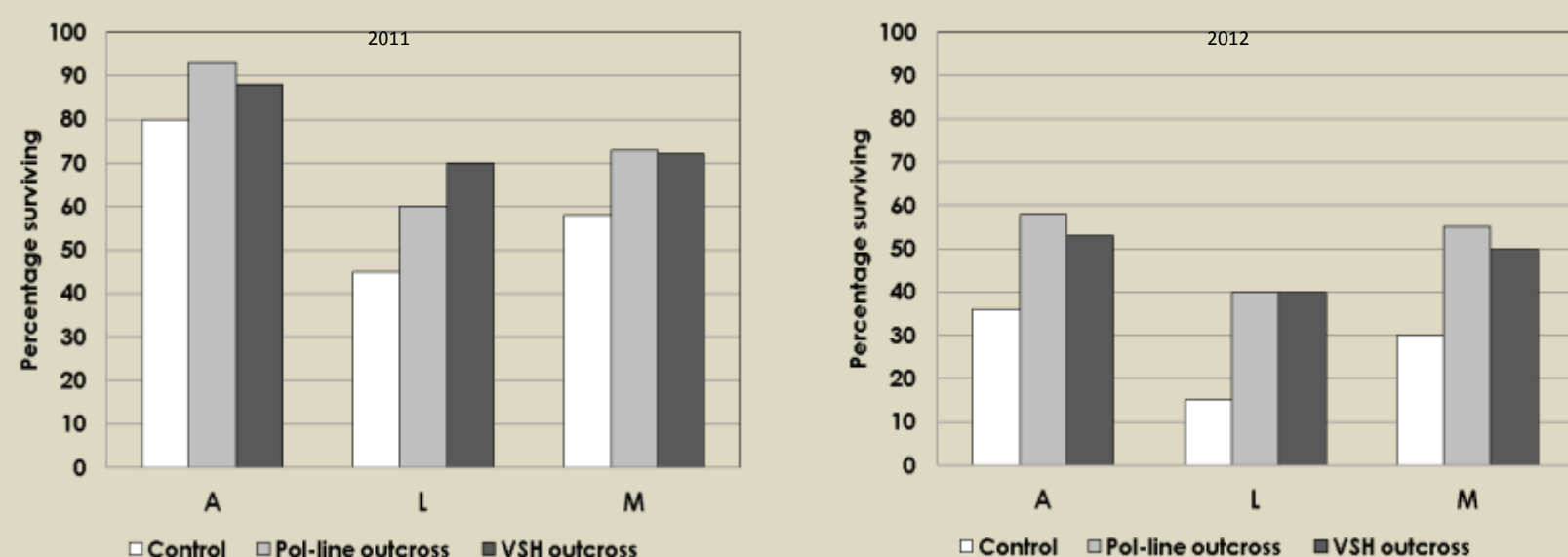


Colonies are managed as usual for the three operations, including long-distance migration to pollination and honey locations.

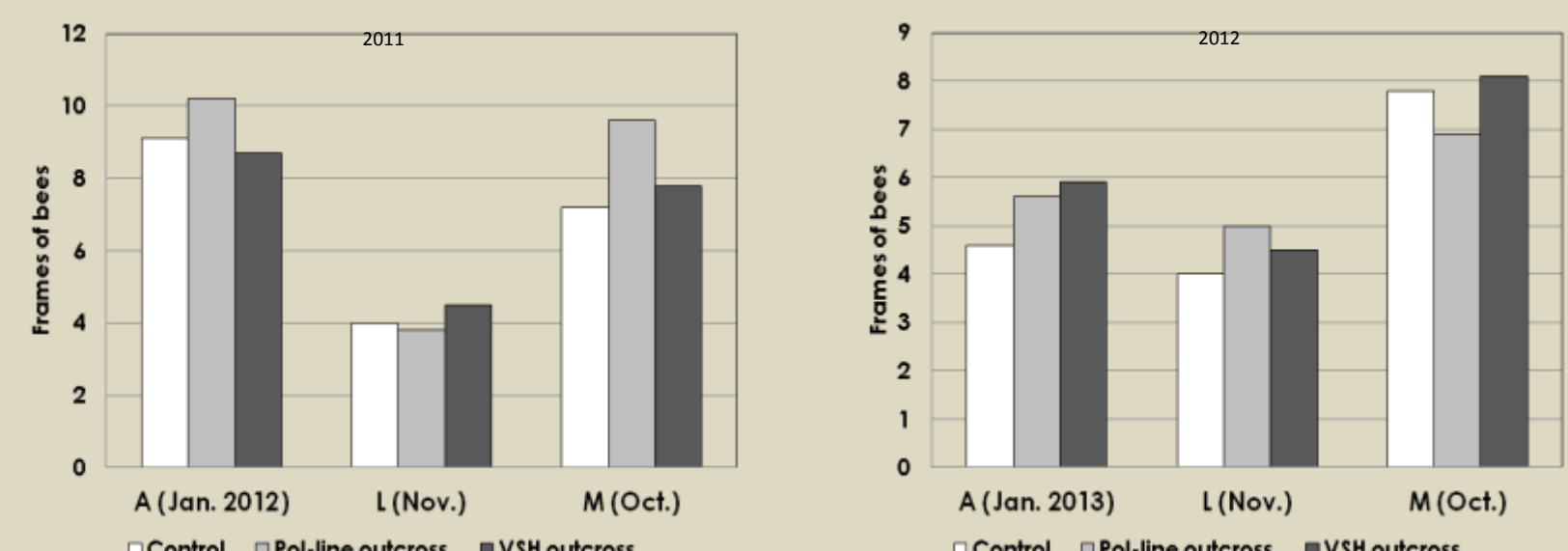


At the end of season, we retrieve the best colonies according to survival, bee population and *Varroa* infestation. Testing and selection in cooperation with these commercial beekeepers has been very successful.

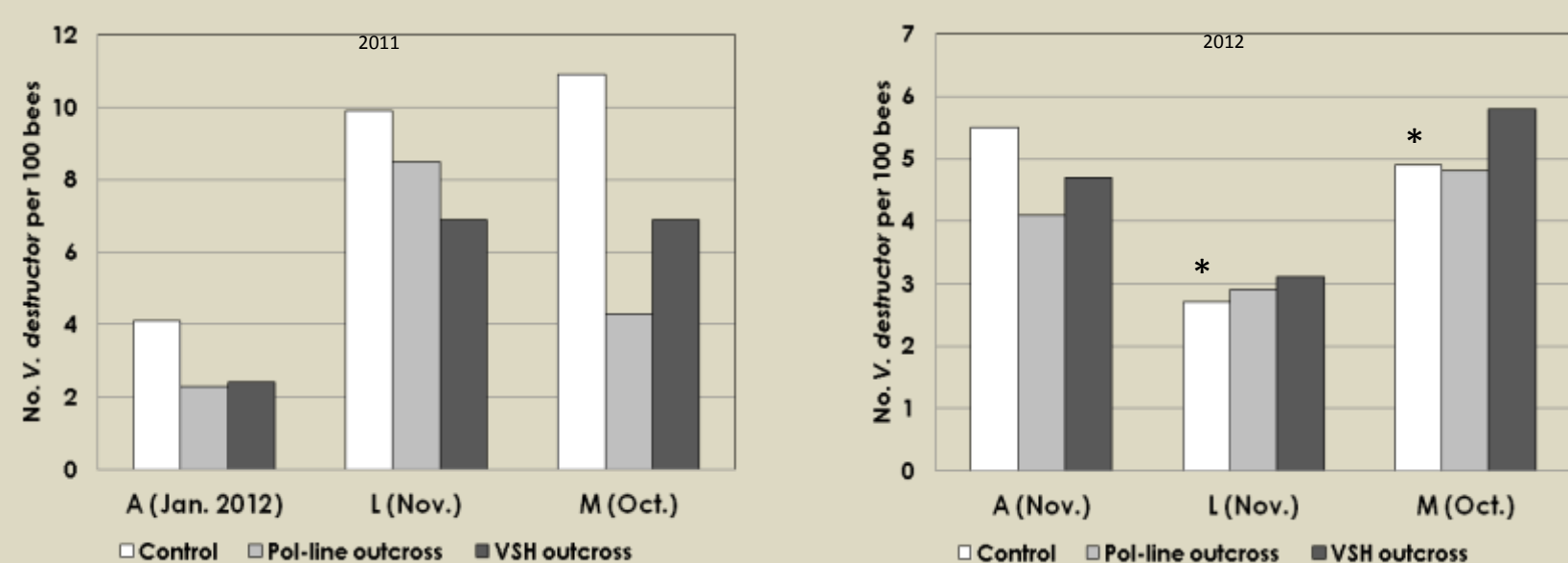
## RESULTS:



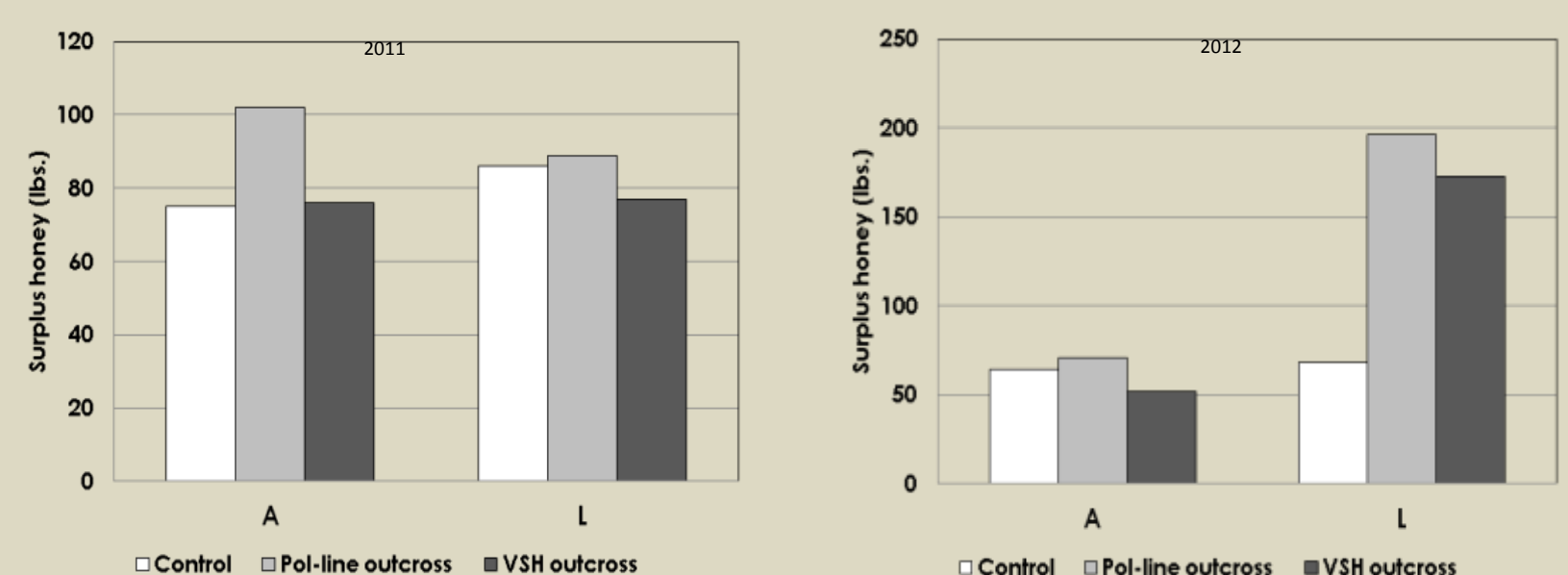
**Fig. 1.** Percentage of colonies surviving with original queens during one season in each of three beekeeping operations (A, L and M). In 2011, A colonies were measured in May in MS and January in CA, L colonies were measured in May and November in TX, and M colonies were measured in April and October in LA. In 2012, measurement times and locations were the same except that A colonies were measured in November in CA. The test began with 560 colonies in 2011 and 407 colonies in 2012.



**Fig. 2.** Frames of bees in late season. Times of measurements appear with each beekeeper identity.



**Fig. 3.** Infestations of *V. destructor* on adult bees in late season. In 2011, no colonies were treated against *V. destructor*. "\*" indicates that beekeepers L and M treated Control colonies with a miticide in 2012.



**Fig. 4.** Honey production. Beekeeper A produced honey in South Dakota; beekeeper L produced honey in North Dakota.

## CONCLUSIONS:

- There is promise that the best of outcrossed VSH colonies – the basis of the Pol-line population -- can themselves be used as breeding sources for sustaining *Varroa* resistance and genetic diversity across multiple generations.
- A critical feature is that this can be done with the method used by most commercial beekeepers, i.e., by selecting the best colonies from the field, using the queens from those colonies as breeders, and then requeening with cells grafted from the breeder queens.
- Pol-line colonies showed functionality as measured by standard beekeeping characteristics. Performance in terms of survival, colony size (frames of bees) and honey production generally matched that of the Control bees, and included enhanced *Varroa* resistance.
- Pol-line stock has been transferred from our laboratory to VP Queen Bees (Frederick, MD; [vpqueenbees.com](http://vpqueenbees.com)) for multiplication and distribution.